

Claims

1. An image data interpolating method characterized by comprising:

an edge direction detecting step of detecting an edge included in image data and a continuing direction of the edge;

an edge smoothing step of smoothing a portion of the detected edge along the edge continuing direction; and

a pixel interpolating step of performing an interpolating process after smoothing the edge.

2. The image data interpolating method according to claim 1, characterized in that in the edge direction detecting step, a facing areas detecting step of dividing an area around a predetermined pixel by a straight line oriented at a predetermined angle by using the predetermined pixel as a reference into two areas and detecting a status of pixels in each of the areas; and an edge determining step of determining the presence or absence of an edge along the straight line on the basis of a difference between the statuses of pixels in the detected two areas are executed.

3. The image data interpolating method according to claim 1 or 2, characterized in that in the edge direction detecting step, an edge pixel detecting step of preliminarily determining whether or not a marked pixel is an edge or not while shifting the marked

pixel for scanning is executed to detect the continuing direction of the edge with respect to the pixel detected as an edge pixel.

4. The image data interpolating method according to any one of claims 1 to 3, characterized in that in the edge smoothing step, pixels neighboring the marked pixel in the edge continuing direction are synthesized at a predetermined ratio while shifting the marked pixel.

5. The image data interpolating method according to any one of claims 1 to 4, characterized in that in the edge direction detecting step, an edge degree detecting step of detecting the degree of coincidence with a predetermined edge direction is executed, and in the edge smoothing step, a smoothness degree adjusting step of increasing the degree of smoothness when the degree of coincidence detected is high and decreasing the degree of smoothness when the degree of coincidence is low is executed.

6. The image data interpolating method according to any one of claims 1 to 5, characterized in that in the pixel interpolating step, when pixel interpolation is executed on the basis of pixels in an area of a predetermined range including a marked pixel in parallel with detection of an edge pixel while shifting the marked pixel, the pixel interpolation is executed so that the marked pixel

is a pixel on the rear side in the scan direction in the area.

7. The image data interpolating method according to claim 6, characterized in that in the pixel interpolating step, when the scan direction is divided into a main scan direction and a sub-scan direction, the pixel interpolation is executed in the area by using a pixel which is on the rear side in the main scan direction and on the rear side in the sub-scan direction as a marked pixel among four pixels surrounding the area to be subjected to pixel interpolation.

8. An image data interpolating apparatus characterized by comprising:

edge direction detecting unit for detecting an edge included in image data and a continuing direction of the edge;

edge smoothing unit for smoothing a portion of the detected edge along the edge continuing direction; and

pixel interpolating unit for performing an interpolating process after smoothing the edge.

9. The image data interpolating apparatus according to claim 8, characterized in that the edge direction detecting unit executes: facing areas detecting unit of dividing an area around a predetermined pixel by a straight line oriented at a predetermined

angle into two areas by using the predetermined pixel as a reference and detecting a status of pixels in each of the areas; and edge determining unit of determining the presence or absence of an edge along the straight line on the basis of a difference between the statuses of pixels in the detected two areas.

10. The image data interpolating apparatus according to claim 8 or 9, characterized in that the edge direction detecting unit comprises edge pixel detecting unit of preliminarily determining whether a marked pixel is an edge or not while shifting the marked pixel for a scan, and detects the edge continuing direction with respect to a pixel detected as an edge pixel by the edge pixel detecting unit.

11. The image data interpolating apparatus according to any one of claims 8 to 10, characterized in that the edge smoothing unit synthesizes pixels neighboring in the edge continuing direction with respect to a marked pixel at a predetermined ratio while shifting the marked pixel for a scan.

12. The image data interpolating apparatus according to any one of claims 8 to 11, characterized in that the edge direction detecting unit comprises edge degree detecting unit of detecting the degree of coincidence with a predetermined edge direction, and the edge

smoothing unit comprises smoothness degree adjusting unit of increasing the degree of smoothness when the degree of coincidence detected by the edge degree detecting unit is high and decreasing the degree of smoothness when the degree of coincidence is low.

13. The image data interpolating apparatus according to any one of claims 8 to 12, characterized in that when pixel interpolation is executed on the basis of pixels in an area of a predetermined range including a marked pixel in parallel with detection of an edge pixel while shifting the marked pixel for a scan, the pixel interpolating unit executes the pixel interpolation so that the marked pixel is a pixel on the rear side in the scan direction in the area.

14. The image data interpolating apparatus according to claim 13, characterized in that when the scan direction is divided into a main scan direction and a sub-scan direction, the pixel interpolating unit executes the pixel interpolation in the area by using a pixel which is on the rear side in the main scan direction and is on the rear side in the sub-scan direction among four pixels surrounding the area to be subjected to pixel interpolation.

15. A medium on which an image data interpolating program for realizing a function of performing pixel interpolation on image

data by a computer is recorded, characterized in that the computer is allowed to execute:

an edge direction detecting function of detecting an edge included in the image data and a continuing direction of the edge;

an edge smoothing function of smoothing a portion of the detected edge along the edge continuing direction; and

a pixel interpolating function of performing an interpolating process after smoothing the edge.

16. The medium on which the image data interpolating program is recorded according to claim 15, characterized in that in the edge direction detecting function, a facing areas detecting function of dividing an area around a predetermined pixel by a straight line oriented at a predetermined angle by using the predetermined pixel as a reference into two areas and detecting a status of pixels in each of the areas; and an edge determining function of determining the presence or absence of an edge along the straight line on the basis of a difference between statuses of pixels in the detected two areas are executed.

17. The medium on which the image data interpolating program is recorded according to claim 15 or 16, characterized in that the edge direction detecting function executes an edge pixel detecting function of preliminarily determining whether a marked pixel is

an edge or not while shifting the marked pixel for a scan, and detects the edge continuing direction with respect to the pixel detected as an edge pixel.

18. The medium on which the image data interpolating program is recorded according to any one of claims 15 to 17, characterized in that the edge smoothing function synthesizes pixels neighboring in the edge continuing direction with respect to a marked pixel at a predetermined ratio while shifting the marked pixel for a scan.

19. The medium on which the image data interpolating program is recorded according to any one of claims 15 to 18, characterized in that in the edge direction detecting function, an edge degree detecting function of detecting the degree of coincidence with a predetermined edge direction is executed and, in the edge smoothing function, a smoothness degree adjusting function of increasing the degree of smoothness when the degree of coincidence detected is high and decreasing the degree of smoothness when the degree of coincidence is low is executed.

20. The medium on which the image data interpolating program is recorded according to any one of claims 15 to 19, characterized in that when pixel interpolation is executed on the basis of pixels in an area of a predetermined range including a marked pixel in

parallel with detection of an edge pixel while shifting the marked pixel for a scan, the pixel interpolating function executes the pixel interpolation so that the marked pixel is a pixel on the rear side in the scan direction in the area.

21. The medium on which the image data interpolating program is recorded according to claim 20, characterized in that when the scan direction is divided into a main scan direction and a sub-scan direction, the pixel interpolating function executes the pixel interpolation in the area by using a pixel which is on the rear side in the main scan direction and is on the rear side in the sub-scan direction as a marked pixel among four pixels surrounding the area to be subjected to pixel interpolation.